Supplemental Appendix:

Malpractice Claim Fears and the Costs of Treating Medicare Patients: A New Approach to Estimating the Costs of Defensive Medicine

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1. Data

a. Physician survey data

The survey data are the Health System Change Health Tracking (HSC-HT) Physician Survey, conducted by Westat for the Center for Studying Health System Change (HSC). Funding was from the Robert Wood Johnson Foundation. The survey was conducted between February and November of 2008. The survey used the AMA Masterfile as its sampling frame, and used stratified random sampling techniques. The strata was based on specialty and geographic region, with no differential sampling probabilities. The sample included non-federal patient care physicians practicing within the United States. Based on information on the sample frame and screener questions in the survey instrument, the survey sample excluded physicians still in training, federal employees, those in specialties with little direct patient contact, such as radiologists, anesthesiologists and pathologists, and those providing less than 20 hours per week in direct patient care. The survey was administered by mail, with telephone follow-up reminders. Content and methods were approved by the Westat IRB.

The survey obtained a 62.1% weighted response rate using AAPOR methods. The sample size was 4,720. Item nonresponse tended to be very low. The survey was weighted to account for probability of selection and differential nonresponse using propensity score methods for to account for nonlocatables physicians and refusals. AMA Masterfile "no-contact" cases were treated as refusals. Detailed information about data collection and weighting procedures, along with a copy of the survey instrument are available on the Center for Studying Health System Change web site.[1]

b. Malpractice questions and scale.

The survey contained a broad range of questions about the physician, his/her practice organization and setting, use of care management, and other topics. Among the topics covered were physician concerns about medical malpractice claims and use of defensive medicine. Five questions, previously developed and validated, were used, as reported in Table 1 of the article.

The responses were coded from 1 (strongly disagree) to 5 (strongly agree). We created an index by averaging the five scores. In previous work, Carrier, et al. 2010[2] investigated alternative means of creating indices from these five questions and found all to be very highly correlated. In this work, we also explored two alternative indices, focusing on the two questions that directly address propensity to engage in positive defensive medicine (statements 3 and 4 in Table 1 in the article) and another that also included the fifth statement, which indirectly speaks to defensive medicine. These indices are very highly correlated (r>.94) with the full five-question index and were consequently not used as they would provide similar results.

2. **Linkage of survey data with Medicare claims**

We obtained the Uniform Provider Identifier Number (UPIN) and National Provider Identifier (NPI) from the vendor who provided the sampling frame. As the conversion from UPINs to NPIs took place in 2007 and 2008, all physician records in Medicare claims contained one, the other, or both identifiers. We were unable to identify a UPIN or NPI for 3.6% of physician respondents and these were not included in the linkage. We used these identifiers to create a finder file. Pediatricians or pediatric specialists were not included as they are unlikely to treat elderly Medicare beneficiaries. A total of 3,526 physicians met criteria for the finder file. The finder file was used to identify any elderly Medicare beneficiary who received any service from HSC-Health Tracking survey respondents during calendar years 2007 through 2009. We excluded the following beneficiaries:

- Beneficiaries below the age of 65
- Beneficiaries not enrolled in both Medicare Parts A and B
- Beneficiaries who were enrolled in Medicare advantage at any time during the 2007-09 period.
- Beneficiaries with end-stage renal disease at any point during the three year period.

Because the finder file identified a larger sample of beneficiaries than we budgeted for (prices increased substantially for each million beneficiaries), we randomly selected physicians to be excluded from the linked sample from each specialist sampling strata. This was done until we had less than 2 million beneficiaries in each year. The physician survey weight was then recalculated to account for the under sampling of specialists. In total, 3,526 were used in our finder file. For each linked beneficiary, the Beneficiary Summary File (formerly Denominator File) and all Parts A and B claims files were obtained.

Because beneficiaries who see a larger number of unique physicians have a greater likelihood of being selected into our beneficiary sample, the sample is skewed towards sicker individuals who presumably see more physicians. To make the beneficiary sample more closely resemble the national population of we assigned a weight to each beneficiary which equaled the physician survey weight of the physician through which the beneficiary was included in the sample (adjusted for the under sampling of specialists) divided by the number of unique physicians seen by the beneficiary during the entire 2007-2009 period. Table A1 shows show characteristics of the sample as compared to CMS administrative data, that closely, but does not precisely match the definition of our sample. No administrative data on a fully equivalent population is available.

3. **Creation of the analysis datasets.**

Figure 1 in the article provides a schematic of the construction of the analysis dataset and analytic procedures. For this analysis, we used only claims from calendar year 2008. This was because it corresponded with the year of the survey. There were a total of 1.84 million beneficiaries in 2008. Of these, 977,000 were seen by a HSC-Health Tracking survey respondent during the year. Since beneficiaries who did not have contact with a physician survey respondent could not contribute to the estimation of the effects of defensive medicine, estimates were based on the smaller subsample. However, that smaller subsample was reweighted to be representative of the larger 1.84 million beneficiary sample. This was done using propensity score methods in which the likelihood of being in the subsample was estimated as a function of beneficiary characteristics (age/gender interactions, and dummies for race (white, black, other), originally eligible as disabled, dually eligible for Medicare and Medicaid, died during year, months alive during the year, and the hierarchical condition category (HCC) score, an indication of patient health status. While estimation of mean specialty-specific contributions to the cost of defensive medicine were based on analysis done on the smaller, n=977,000 weighted sample, the aggregate estimate of the average defensive medicine cost per beneficiary was calculated on the full weighted sample of 1.84 million beneficiaries.

4. Unit of analysis and estimation

For patients in the n=977,000 subsample, we only observe the malpractice concerns of one of the physicians they saw. Moreover physicians in different specialties have different risks of malpractice claims, and differ in their opportunities to take steps to reduce the risk of malpractice liability. Consequently we stratified physicians into 12 mutually exclusive specialty categories, as shown in Table A2. If more than 75 physician survey respondents were in a given specialty, that specialty was used except that we combined primary care specialists (family medicine, internal medicine, and geriatric medicine) into a single category. For the remaining specialists with fewer than 75 observations, we combined them into three groups: cognitive, procedural, and surgical specialists with the assistance of a physician consultant. We also tried alternative classifications of these small n specialties based on the risks of malpractice claims based on their access to ordering services, whether they treat high stakes cases, and whether they generally had established long-term relationships with patients. This alternative classification did not produce results that were consistent with expectations or was in any way superior to the original function-based classification. It was dropped. When inconsistent specialty information was found on claims data for a given physician, we used the plurality specialty listed.

Nearly 3,200 survey respondents were used to form the 977,000 specialty/beneficiary dyads. This number is substantially smaller than the 1.84 million full sample because some physician respondents did not provide services to sample beneficiaries in 2008, or were missing information on their specialty (from claims) or malpractice fears (from the survey).

Our unit of analysis is the specialty/beneficiary dyad. That is, we assume that if a beneficiary who saw a specialist in category i, the one physician of whom we have malpractice fears is representative of other physicians in the same specialty the beneficiary saw during 2008. We do not explicitly capture the fact that malpractice concerns could influence the number of unique physicians within the specialty seen, as the number is too closely associated with underlying patient health, and hence costs. However, the estimates do account for the costs associated with referrals to physicians in other specialties/specialty groups, including the costs of associated care (e.g. anesthesiology costs associated with surgeries that result from a referral from a primary care physician).

5. Estimation

Twelve models were estimated corresponding to the twelve specialties/specialty groups. These were estimated using a generalized linear model with a log link and the gamma distribution. This has been found to be suited for estimation of health expenditure data, which is highly skewed to the right.[3] The key variable in these models was the malpractice index, which ranges in value from 1 to 5. In addition, we included patient covariates as listed in the article. We also experimented including the hierarchical condition category (HCC) score of the beneficiary, but its inclusion had little impact on the malpractice fear index coefficient and it was not included in final models.

Table 2 in the article provides the sample size of beneficiary/physician specialist dyads used in each of the 12 GLM models as well as the key coefficient on the malpractice fear index and its significance level. Also contained in that exhibit are average values of the malpractice concern index among physicians in each specialty. Full estimate results are available from the authors.

Because of how the beneficiary sample was constructed, the 12 GLM models were estimated on 12 distinct, non-overlapping patient groups. As such we were forced to estimate the 12 equations not as a system, but under the assumption that physician malpractice fears were independent of the malpractice fears of other physicians treating the same patient. There are several reasons why this assumption may not hold:

- Physicians may refer to other physicians who have similar treatment patterns, which may reflect a common level of physician malpractice concerns.
- Patients may have preferences for physicians with certain treatment styles (e.g., aggressive diagnostic testing and treatment vs. conservative practice) which in turn are influenced by physician malpractice fears.
- Common local market or cultural factors could influences on physician malpractice fears within a small geographic area.
- Physicians with greater malpractice fears may have a greater propensity to refer patients. As such, the specialist physicians to whom patients of fearful physicians are referred to may see a less acutely ill patient population, allaying their own malpractice fears.

The first three of these scenarios suggest the possibility that physician malpractice fears may be positively correlated, while the last one suggests the opposite. Positive correlations suggest that our assumption of independence may result in positive bias in our estimates of defensive costs, while negative correlations would bias results downward. We examined whether physician malpractice fears were correlated among those practicing in the same county. Using a hierarchical random effects model, we calculated the intra-cluster correlation. This was found to be extremely small (.0006). A second model that contained a number of physician and physician practice characteristics as covariates produced an ICC estimate that was half as large. These results suggest that concerns about correlated malpractice fears may not be a concern. However, such correlations might be larger if we were able to examine correlations within a referral network or among physicians in a multi-specialty group, physician-hospital network, or other organizational grouping.

Another potential threat to validity is that we assume additivity. We assume that the impact of malpractice fears on patient costs by one physician is not affected by the malpractice fears and subsequent clinical decisions made by other physicians. Again, the data available to us did not allow for testing this assumption. While clearly relevant to estimating the costs of a given patient, the impact of this assumption on aggregate cost estimates is less clear.

We tested several alternative specifications for robustness. For instance specialty models were estimated using OLS. We also we explored alterative model specifications that accounted for the number of physicians within a given specialty treating a patient during the year, a specification that could address some of the concerns about additivity. However, we abandoned this approach because the number of different physicians seen within a specialty is likely to be strongly related to patient health, such that is it difficult to separate the influence of malpractice fears on the number of physicians seen from the otherwise unmeasured variations in patient health on both the number of physicians seen and patient costs.

Creating marginal effects: specialty-specific estimates of the contribution to defensive medicine

For each of the 12 GLM equations, we generated simulations, expressed in natural units (e.g. dollars) that represent the regression-adjusted prediction, should the physician's malpractice index be set at a different—typically lower level. This constituted the basis of our estimate of the cost of defensive medicine: how much less expensive would the patient's total costs be if physicians seen in specialty i be less concerned about the monetary and psychological costs of malpractice claims. As described in the article, we conducted three sets of simulations and produced three sets of marginal effects. The GLM models and simulations were conducted using Stata.

The three simulations were associated with the three counterfactuals described in the article:

> a. All physicians had a malpractice concern index set a one, which is associated with being not at all concerned about malpractice claims and not reporting any actions consistent with defensive medicine.
>
> b. All physician had a malpractice concern index set at two, except for those whose actual index value was less than two. For those physicians, there was no change in their index value and the simulated cost of defensive medicine was implicitly zero. A value of two is roughly associated with agreeing with malpractice concern and defensive medicine questions, but not strongly agreeing. We characterize this as being "somewhat" concerned about medical malpractice claims or somewhat likely to agree with questions regarding defensive medicine.
>
> c. All physicians had a malpractice concern index set at the 20th percentile value for physicians in their specialty category, except for those physicians who index value fell below the 20th percentile. Hence, this recognizes that physicians in different specialties have different risks and concerns of malpractice claims, something that a policy that substitutes our current malpractice tort system would not likely change.

The final simulation we conducted was simply akin to the marginal effect of lowering each physician's malpractice index score by a value of one.   Those with scores less than two would have their scores reduced to one, the minimum value. We do not report the results of this simulation. They were consistently the smallest in magnitude, and are available from the authors upon request.

Table A3 shows the weighted mean values of these alternative marginal effects across the 12 specialty categories.

6. **Generating estimates of the cost of defensive medicine for the entire sample of Medicare beneficiaries.**

We generated the estimates of the costs of defensive Medicine across our sample of elderly Medicare beneficiaries using the full 1.84 million beneficiary dataset. Essentially, for any given beneficiary j, the cost of defensive medicine—as it pertained to that patient—was calculated as the sum of the mean marginal effect estimates (as shown in Table A3) associated with all specialty categories that patient had any billing contact with during the year:

$$DM_{jk} = \sum_{i=1}^{12} D_{ij} * MrgEff_{ik}$$

Where: DM_{jk} = Estimate of cost of defensive medicine for beneficiary j under counterfactual k

D_{ij} = Dummy (0, 1) variables indicating beneficiary j received services from any physician in specialty category i during 2008.

$MrgEff_{ik}$ = Specialty category i mean marginal effect (i.e., specialty specific contribution to defensive medicine from GLM equations), given counterfactual k.

Individual patient defensive medicine cost estimates were calculated based on the above formula and averaged across the full weighted sample of 1.84 million beneficiaries to generate the values reported in Exhibit 3 of the article. In total, there were nearly 68 million specialty/beneficiary dyads. Defensive medicine estimates were inflated to represent 2014 dollars using the CPI-U index.

In this approach to combining specialty-specific estimates to generate total defensive medicine cost estimates, we assume additivity of these specialty-specific contributions to defensive medicine costs to generate total defensive medicine costs. As such, this presents a potential source of bias in our total cost estimates, one that we were not able to devise a test to evaluate.

7. **Variance estimation**

In order to generate both correct estimates of the variance of overall estimates of the total cost of defensive medicine, we bootstrapped the entire estimation process, including the estimation of the 12 specialty specific GLM models, the calculation of marginal effects from these models, and the aggregation of these estimates across our full beneficiary sample. One hundred replicates were used. From these, we constructed the 95% confidence intervals and standard error estimates.

8. Estimating specialty contributions to the cost of defensive medicine

In Table 4 of the article we show the relative contributions to our estimates of the cost of defensive medicine under the second ("somewhat concerned") counterfactual by members of the 12 specialty groups. This was calculated by multiplying the number of beneficiary/specialty category dyads in our 1.84 million beneficiary sample (which total nearly 68 million in number) and multiplying those numbers by the specialty-specific marginal costs of defensive medicine for the same counterfactual as reported in Table A3. The products were then normalized so that they summed to our estimate that on average the cost of defensive medicine is $1481 under the second counterfactual (See Table 3. In the article). Implicitly, the values are inflated to 2015 dollars.

Primary care physicians contributed the most to defensive medicine costs, contributing to over 40% of total defensive medicine costs (the relative contributions were not sensitive to choice of counterfactual). Primary care physicians provide the largest proportion of patient/specialty dyads (21%) and contribute to defensive medicine costs in two ways. First, they may provide additional services in order to reduce the risk of malpractice claims, most likely diagnostic tests. Second, their decisions to refer patients to specialists are also reflected in these cost estimates. Referral of a patient to a specialist will result in additional costs stemming from that specialist's costs. These will mostly be attributed to the referring physicians under our estimation scheme, while the marginal costs attributed to the specialist to whom the patient was referred to only represent the marginal effect of malpractice fears, given that a patient has come to see them. The propensity to refer patients to emergency departments or admit patients to hospitals in response to malpractice concerns would also contribute to a physician's defensive medicine cost estimate. The second most costly specialty group is "other surgical specialists," contributing 29% to total defensive medicine costs. They contribute nearly 12 percent of patient/physician category dyads, but as shown in Table A3, contribute considerably to defensive medicine costs at the margin. This group includes specialties such as urology that provide both considerable diagnostic and procedural care. The specialty group contributing the third most defensive medicine costs are emergency medicine physicians, who represent half as many patient/specialty group encounters as other surgical specialists, but led other specialty groups in their marginal contribution to defensive medicine costs (Table A3).

Consistent with the negative coefficients shown in Exhibit 2 in the article, three specialty groups had negative contributions to the cost of defensive medicine, most notably other procedural specialties and orthopedic surgeons.

9. Generating type of service estimates.

We choose to further divide costs into 9 categories, which together encompass total Part A and B spending by Medicare, patients, and other payers. These spending categories are listed in Table A4 and are based in part on Berenson-Eggars Type of Service (BETOS) categorization as it pertains to physician costs. Preserving our strategy of estimating defensive medicine costs across 12 specialty groups, we estimated the marginal effect of defensive medicine for each of the nine categories of spending, for each of the 12 subsets of beneficiaries defined by whether the specialty of the HSC-HT survey respondent they received services from. This resulted in a total of 108 models being estimated. For each type of service, total costs of defensive medicine were aggregated in the same manner described above.

We approached the estimation in two ways to assess robustness. First we estimated simple ordinary least squares equations. Second, recognizing that many of the dependent variables had a large mass of observations with the value of zero (i.e., relatively few had a major procedure in any given year), we estimated two-part models in which the first part was estimated as a logit and predicted the likelihood of having positive expenditures in the service category, while the second part was again a GLM model that used a log link and gamma distribution to account for skewness. The results of these two approaches are reported in Table A4. Again we present the results from the second counterfactual, as the results under the other counterfactuals were very similar. The results from the two estimation approaches overall were similar, although some sizable differences were evident. Inpatient spending and post-acute care were by far the largest contributors to the total cost of defensive medicine. While many may attribute defensive medicine costs primarily to greater diagnostic testing, the cost of a single hospitalization is sufficiently large that it would swamp the costs of many, often expensive diagnostic tests. The contribution of “other surgical specialists” to overall defensive medicine costs may also help explain the importance of inpatient and post-acute care to the extent procedures were conducted in inpatient settings. Inpatient spending comprised 39.8% and 47.5% of the total cost of defensive medicine under the second counterfactual when using OLS and the two-part model, respectively. Post-acute care was similarly larger when the two-part model was used and only slightly less important in magnitude than inpatient cost. Evaluation and management visits (presumably a product of greater propensity to refer when physicians were more concerned about malpractice claims, was the third most important category of spending, but this contributed only 11-13% of the total under the two estimation approaches. Of note, minor procedures were associated with a reduction in the costs of defensive medicine (potentially suggesting that they improve care land lower total costs) when the 2-part model was used, but were estimated to have a very small, but positive impact on defensive medicine costs when OLS was used. Diagnostic tests (including imaging studies) only contributed 5-6 percent of the total costs of defensive medicine. Given the only very modest degree of robustness across estimation approaches, these results should be interpreted with some caution.

Potential bias from excluding physician and practice covariates from expenditure models.

Because claims data do not have information on physician and practice characteristics (beyond physician specialty), the expenditure models only contained patient characteristics as controls. This raises the question of whether the omission of physician and practice characteristics might bias the estimates of the effect of physician malpractice fears on patient costs. In earlier research by Carrier and colleagues (2010), physician malpractice fears were associated with physician and practice characteristics from the 2008 HSC-HT physician survey. Beside specialty, physicians with more than 10 years of experience had lower fears than those with less than five years of experience, female physicians had lower fears than male physicians, and those with a majority of patients who have chronic conditions had greater fears than those with less than 10% of their patients with chronic conditions. As for practice characteristics, physicians in practices with 11-50 physicians had greater fears than those in solo or two-physician practices. Other characteristics, such as the percentage of minority patients, use of health information technology, and urbanicity of practice location were not related to physician malpractice liability fears.

In the hierarchical random effects models of physician malpractice fears (using SAS PROC MIXED) that we previously discussed, we estimated models with two specifications. One only had the physician malpractice fear index as the explanatory variable and the other added a detailed set of physician specialty dummies and other physician and practice characteristics. In Table A5, we show the model results from this second model, excluding the results on physician specialty categories. Model results (which also control for the county in which the physician practices) parallel many of the results reported by Carrier, et al. 2010. For the most part, physician and practice characteristics were not significantly associated with malpractice fears. Exceptions included physician gender and years of experience. were significantly associated with malpractice liability fears. Practice type was mostly unrelated to malpractice fears, although physicians practicing in medical schools had lower fears than those in solo practice. Finally, the percent of practice revenue from Medicare was significantly associated with higher malpractice fears. For all these statistically significant estimates, however, the magnitude of the coefficients were small relative to the range of the dependent variable. These results do not allow us to dismiss concerns that our defensive medicine estimates might be biased due to confounding, but they suggest that the likelihood that excluded physician and practice variables might substantially bias our results is likely small.

The PROC MIXED results also suggest that physician in practices that receive a larger share of their revenue from Medicare have higher malpractice fears. This speaks to the generalizability of our results discussed in the article's limitation section. That said, it should be noted that the coefficient on this variable is very small.

Notes

[1] Strouse R, Potter F, Davis T, Hall J, Williams S, Herbold E, Walsh J, Boukus E, Reschovsky J. HSC 2008 Health Tracking Physician Survey Methodology Report. [Internet] Sept 2009. Technical Publication No. 77. [Cited 1 June 2015] Washington, DC: Center for Studying Health System Change. Available at http://hschange.org/CONTENT/1085/

[2] Carrier ER, Reschovsky JD, Mello MM, Mayrell RC, Katz D. Physicians' fears of malpractice lawsuits are not assuaged by tort reforms. Health Aff (Millwood). 2010 Sep;29(9):1585-92.

[3] Buntin, M., and A. Zazlavsky, 2004. Too Much Ado about Two-Part Models and Transformation? *Journal of Health Economics.* 23:525-542.

Table A1. Characteristics of the Medicare Elderly Fee-for-Service Beneficiary Population and Linked Samples

	2008 CMS administrative data	All linked beneficiaries, 2008 (weighted) (n=1.84 million)
Age group (%)		
65-74	52.4	46.0
75-84	33.1	36.7
85 Years	14.5	17.4
Region (%)		
Northeast	19.8	19.2
Midwest	23.1	26.0
South	36.2	38.4
West	20.8	16.3
Sex (%)		
Male	42.8	41.1
Female	57.2	58.9
Race (%)		
White	85.3	89.8
Black	8.2	6.3
Other	6.5	4.0

SOURCES: Medicare and Medicaid Statistical Supplement, 2009 Edition, available at http://www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/MedicareMedicaidStatSupp/2009.html and authors' calculations from 2008 linked Health System Change Health Tracking Physician Survey/Medicare claims data. Note that aadministrative data does not exist that describes the precise population of beneficiaries represented by the linked data sample, although the populations are similar. For instance, the linked sample excludes beneficiaries with end-stage renal disease as well as other groups included in the administrative data.

Table A2. Classification of physician specialties into 12 categories

Specialty category	Claims specialty	Number of physicians
Primary Care	PCP	1173
Obstetrics/gynecology	Obstetrics/gynecology	203
Ophthalmology	Ophthalmology	122
Orthopedic surgery	Orthopedic surgery	129
Psychiatry	Psychiatry	134
Emgerency medicine	Emergency medicine	158
Cardiology	Cardiology	125
General surgery	General surgery	135
Dematology	Dermatology	79
Other Cognitive Specialties	Critical care (intensivists)	588
	Nephrology	
	Pulmonary disease	
	Pain Management	
	Addiction medicine	
	Allergy/immunology	
	Hematology	
	Physical medicine and rehabilitation	
	Endocrinology	
	Neurology	
	Infectious disease	
	Hematology/oncology	
	Neuropsychiatry	
	Medical oncology	
	Preventive medicine	
	Pathology	
	Rheumatology	
	Hospitalist	
Other Procedural Specialties	Diagnostic radiology	88
	Interventional Pain Management (IPM)	
	Gastroenterology	
	Nuclear medicine	
	Radiation oncology	
	Interventional radiology	
Other Surgical Specialties	Cardiac surgery	264
	Otolaryngology	
	Neurosurgery	
	Plastic and reconstructive surgery	
	Podiatry	
	Peripheral vascular disease	
	Surgical oncology	

Table A2. Classification of physician specialties into 12 categories

Specialty category	Claims specialty	Number of physicians
	Colorectal surgery (formerly proctology)	
	Vascular surgery	
	Maxillofacial surgery	
	Oral surgery	
	Thoracic surgery	
	Urology	
	Hand surgery	
	Gynecologist/oncologist	
	Anesthesiology	
Total		3198

Table A3. Weighted mean specialty-specific marginal costs of defensive medicine under three counterfactuals.

Specialty	Number of observations	Counterfactual with regard to physician medical malpractice concerns: All not at all concerned	All not more than somewhat concerned	All at most concerned at 20th percentile within specialty
Primary care specialties	343,609	$957	$632	$385
Cardiology	117,432	394	255	178
Ophthalmology	92,354	116	76	40
Dermatology	65,546	464	303	180
Emergency medicine	52,176	1,489	1,050	369
Orthopedic surgery	37,541	-1,099	-744	-221
General surgery	26,394	549	371	138
Obstetrics/Gynecology	16,101	-630	-421	-194
Psychiatry	7,483	1,006	608	459
Other cognitive specialties	98,138	497	320	221
Other surgical specialties	79,814	1,142	775	427
Other procedural specialties	31,221	-320	-192	-122

Table A4. Relative contribution of different types of medical services to per beneficiary estimate of the cost of defensive medicine under counterfactual #2 (somewhat concerned)

	Estimation model used:	
Type of service	OLS	2-Part[1]
Inpatient	39.8%	47.5%
Post-acute care	34.3	39.3
Evaluation and management visits	13.3	11.3
Other services	7.9	5.0
Advanced imaging	4.4	3.4
Simple imaging	0.7	1.3
Other diagnostic tests	0.6	0.2
Minor procedures	0.4	-6.7
Major procedures	-1.7	-1.3
Sum	100.0	100.0

Source: Linked 2008 HSC-HT Physician Survey and Medicare claims dataset.

[1]Two-part model consisted of a logit equation estimating positive expenditures in type of service and, conditioned on any expenditures, a GLM expenditure model using a log link and gamma distribution.

Table A5. Hierarchical random effects model of physician malpractice liability fears.

	Coefficient		P-value
Constant term	3.630		0.000
Physician Characteristics			
Physician specialty (results omitted from table)			
Years in practice	-0.011	***	0.000
Gender=Female	-0.142	***	0.000
Board Certified	0.061		0.259
Practice ownership			
Full owner (ref)			
Part owner	0.112		0.053
Employee	0.018		0.759
Independent contractor	0.075		0.376
Practice Characteristics			
Practice type			
Solo practice (ref)			
Two physician practice	0.064		0.366
Group with 3+ physicians	-0.012		0.842
Group or staff model HMO	-0.071		0.504
Community Health Center	-0.055		0.626
Hospital run by government	-0.076		0.513
Private Hospital	0.004		0.960
Medical School	-0.190	*	0.026
Other	0.040		0.820
Racial/ethnic mix of practice's patients			
% white	-0.001		0.475
% Hispanic	0.000		0.905
% Asian, South Pacific	-0.003		0.096
Sources of practice revenue			
% revenue from Medicare	0.002	**	0.010
% revenue from Medicaid	-0.001		0.137
% revenue that is from capitation	-0.001		0.238

***p≤0.001;**p≤0.01;*p≤0.05

Source: 2008 HSC-HT Physician Survey

Notes: The sample consisted of physician survey respondents who practice in counties with at least one other survey respondent (n=4,213). The model used SAS PROC MIXED, clustered on county. A set of physician specialty dummy variables were also included in the model, but omitted from the table.